fact, are the most frequently recurrent and concurrent planes of a crystal. The far greater elegance of the stereographic projection for the representation of the zones of a crystal than the sort of contracted and symbolised Quenstedtian method employed by Professor Dana will certainly prevent this latter from ever becoming adopted in other works. Passing from the crystallographic to the chemical notation, we may say that Professor Dana accepts a sort of nuclear theory of chemical combination, and illustrates this by a corresponding notation. As, however, the use of this system is only partially introduced into the work, we may dismiss it with the remark that, inasmuch as the use of formulæ of one shape or another to express a particular compound can only be a relative and not an absolute expression of the modes in which its elementary units are combined, when one such formula or system of formulating is to be conventionally selected for adoption, that will be the best to select which expresses best the relations between the compounds from the point of view of the author employing them. Professor Dana's does not seem to us to meet this requirement as from the point of view of the mineralogist.

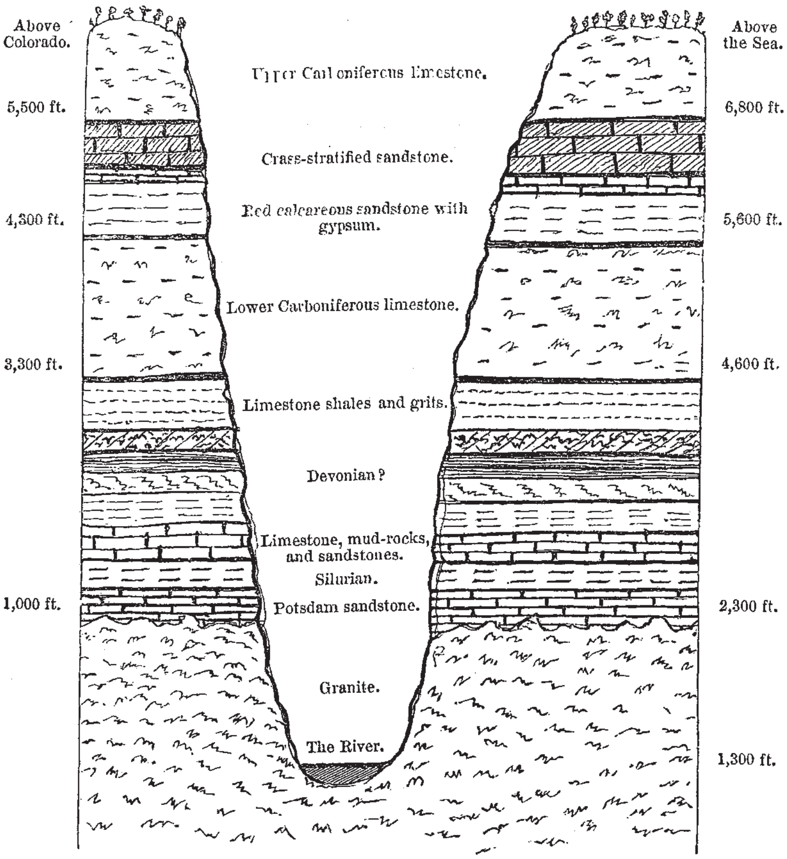
N. STORY MASKELYNE.

BELL'S NEW TRACKS IN NORTH AMERICA

New Tracks in North America: A Journal of Travel and Adventure in 1867–68. By W. A. Bell, M.B., F.R.G.S., &c. With a map, 20 lithographs, 22 woodcuts, and 3 botanical plates. 2 vols., 236 and 322 pp. (Chapman & Hall.)

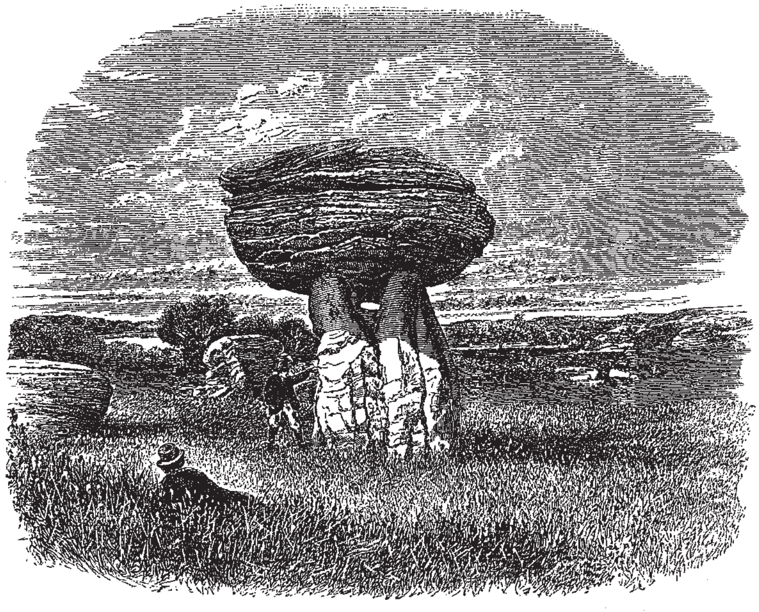
THIS is an unusually important book of travels, giving interesting particulars of the vast wild Western country which, though still the home of the Apache and the Buffalo, is every day being more and more brought into subjection by the settlers, traders, miners, capitalists, and railways of the "Anglo-Saxons" of America, as Dr. Bell calls them.

The author was well placed for obtaining reliable information, having been attached in 1867 to the surveying expeditions of the Pacific Railway as photographer and physician. In this manner he travelled "about 5,000 miles beyond the pale of civilisation and railways." His contributions to the physical geography of the astonishing country south-west of the Rocky range are carefully done. He writes a brief treatise on the natural drainage system of the district, and especially of the Great Basin, which is considerably larger than France, and so-called because none of its rivers reach the sea. The reason of this is not that it is a basin with a rim all round to act as an insurmountable barrier to drainage, but rather because it is in reality a collection of hundreds of smaller basins, each of which has its stream and lake, which lose by evaporation and percolation what is supplied by the limited rainfall. Cultivation is, however, increasing the rainfall in Utah, and the Great Salt Lake has consequently of late years been steadily rising. The rainfall from year to year is irregular. At Fort Yuma, on the borders of California and Arizona, it was in four recent years 0·33, 8·57, 4·20, and 2·94 inches. Irrigation must be resorted to for all agricultural operations.


Above Colorado.
Above the Sea.
Upper Carboniferous limestone.
5,500 ft.
6,800 ft.
Cross-stratified sandstone.
Red calcareous sandstone with gypsum.
4,300 ft.
5,600 ft.
Lower Carboniferous limestone.
3,300 ft.
4,600 ft.
Limestone shales and grits.
Devonian?
Limestone, mud-rocks, and sandstones.
Silurian.
1,000 ft.
Potsdam sandstone.
2,300 ft.
Granite.
The River.
1,300 ft.

SECTION OF THE CANON OF THE COLORADO ON THE HIGH MESA, WEST OF THE LITTLE COLORADO (BY J. S. NEWBERRY, M.D.)

The barren, monotonous mountain ranges of the great basin are rich in minerals. One silver lode, the Comstock, yields annually four millions sterling, or more than all the mines in Mexico, and Nevada furnished twenty million dollars of gold in 1867 to California's twenty-five. Copper and iron are also plentiful, and the unworked coal-fields are numerous. Hydraulic power is now employed in mining in California. The machine used was invented in 1852 by one Mattison, of Connecticut, and directs a stream of water from a two-inch pipe under a pressure of perhaps 200 ft. perpendicular, which gives a tremendous force, against a bank or hill-side, containing *placer* gold, tearing down the earth into the washing sluices with great rapidity. This powerful agent is stated to be changing the face of the country: obliterating valleys, levelling hills, turning rivers from their course, and covering fertile tracts miles in extent with bare heaps of gravel.



MUSHROOM ROCK

The most distinctive features of the great basin are the cañons, those narrow, deep, abrupt, and continous chasms at the bottom of many of which run rapid rivers, unapproachable by man or animal. They are due to the action of water, being formed by the passage through a dry region of never-failing and rapid streams, coming from distant sources exterior to the dry country. The water has worn its way in some instances through 1,000 ft. of granite. Where these deep cuttings abound, the country is sterile, for they drain it to the uttermost, and the streams lie far below the reach of surface animal or vegetable life. One cañon, that of the Purgatoire, has been so named because of the "bright, fiery-red sandstone" of which its walls are composed; the effect of the mass of colour is said to be wonderful. In another, the Aravaypa, a cliff below the average, was measured, and found to be 825 ft. high.

THE CEREUS GIGANTEUS

Here, when the sun had left the upper world, and night had really come, the blackness of darkness around was something awful, and the stars which covered the narrow streak of sky above seemed to change the heavens into a zigzag belt, every inch of which was radiant with diamonds.

In the valley beyond this cañon, nearly all the water of the Aravaypa sinks into the earth. But the cañon of cañons is the great cañon of the Colorada, discovered by Lopez de Cardenas in 1540, which is but 100 feet wide at its narrowest, while its greatest depth has been barometrically ascertained to be 7,000 feet, or one mile and a third. The sun only shines into this terrible chasm for an hour a day, and it is 550 miles long. At its bottom runs the swift river from which it takes its name. The account which Dr. Bell gives of James White's flight for life down this previously unexplored cañon on a raft, makes a wonderful sensation story, which appears to have found believers. We reproduce from Dr. Bell's book a geological section of this remarkable gorge.

The alkali flats form another distinctive feature in the basin. They are covered with salts, usually nitrate of soda, and being perfectly barren, form white glistening sheets which, in the dry unsteady atmosphere of the desert, become tantalising mirages. The plateaux of the basin region were the last portions of the West which were raised from the sea; even now subterranean fires are active, and it is quite possible that gradual upheaval may be still going on. Earthquakes are frequent; mud-volcanoes are still to be found in places; huge surface cracks have occurred within the memory of living men, and Dr. Bell counted 52 jets of steam issuing from the ground in one valley. A considerable number of the known species of cactus are found about the Mexican boundary line; of one of these, the *Cereus giganteus*, which is sometimes called the Monumental cactus, we give an illustration: the mistletoe grows in the same region. We also give an engraving of the "Mushroom Rock," one of the many similar monuments, denuded and abraded by water, which are to be found in the arid plains of Kansas. Dr. Bell's book contains thoughtful matter on the Indian races of the past and present sufficient for a monograph on the subject. He writes briefly and sensibly on the Mormons, denying the common assertion that Salt Lake City, setting aside polygamy, is a moral place, and stating that there is an entire absence of religious devotion. The Joe Smith anti-polygamy party are making rapid strides, especially in the numerous outlying settlements in Utah and Nevada.

OUR BOOK SHELF

Lehrbuch der Chimie, *gegründet auf die Werthigkeit der Elemente.* Von. A. Geuther, Prof. in Jena. Erste Abtheilung. (Jena: Dœbereiner, 1869.)

THE doctrine of Quantivalence plays a most important part in the general theory of modern chemistry; but when carried out to the extreme lengths which Dr. Geuther claims for it, this doctrine, so useful in the classification of elements, fails altogether to bear an original meaning. The following is an extract from a table, on page 16 of the above-named work, showing the Quantivalence of the elements according to Geuther:—

$H = 1$

As	V. III. I.	Na	V. IV. III. II. I.
Ba	II. I.	Os	VIII. VI. IV. III. II.
Br	VII. V. III. I.	S	VI. IV. II. I.
Cs	V. IV. III. II. I.	N	V. III. I.
Cl	VII. V. III. I.	Ag	IV. II. I.
Cr	VI. IV. III. II.	K	V. IV. III. II. I.
Fe	VI. IV. III. II.	Mn	VII. VI. IV. III. II.
Fl	(VII.) (V.) III. I.	I	VII. V. III. I.

Here, for example, we find potassium described as acting as a monad, a dyad, a triad, a tetrad, and a pentad element, and chlorine as a monad, dyad, triad, pentad, and heptad element. What does this do more than express, in a roundabout and inconvenient way, what Dalton long ago enunciated as combination in multiple proportions—that great law round which the whole structure of the science is built up?

The doctrine of Quantivalence is, in strictness, only applicable in the case of gaseous elements and compounds; bodies whose molecular weight can be estimated by their vapours obeying Avogadro's law of volumes, viz. that the molecule of an element or compound is that weight of the body which occupies in the gaseous state the volume of hydrogen gas weighing 2: the Quantivalence of an element being determined by the number of atoms of hydrogen or of chlorine, or other distinctly monad element or radical, which it may be able to take up in this molecular volume. By an extension of this reasoning, we term potassium a monad and barium a dyad metal, because we find that they each form only one compound with chlorine, potassium combining with one atom and barium with two; and we assume that KCl and $BaCl_2$ represent the respective molecular weights of the compound. Many metals, doubtless, may be considered to exhibit a variation in Quantivalence: such as iron in the ferrous and ferric chlorides; mercury in Hg_2Cl_2 and $HgCl_2$: though this difference may be also explained in the case of mercury by the two atoms of metal being joined together. But to term chlorine a heptad because it forms the compound $HClO_4$, or potassium a pentad because we know of the body K_2S_5, appears to be an exaggeration of a useful doctrine almost as unphilosophical as the divisible atoms of M. Delavaud. Apart from these views, Prof. Geuther's book will be welcomed by all chemists as containing clear and concise descriptions of many compounds not mentioned in other manuals, which are of much importance for the theory of modern chemistry. H. E. ROSCOE

Parasitology.—*Zeitschrift für Parasitenkunde.* Herausgegeben von Dr. E. Hallier und Dr. F. A. Zürn. Band I. Zweites Heft. 8vo. pp. 126, with 2 Plates, price 3*s.* (Jena, 1869. London: Williams and Norgate.)

THERE can be no more conclusive evidence of the vigour with which scientific researches are pursued in Germany than the fact that a circulation is found for a periodical publication devoted entirely to the study of parasites, animal and vegetable. We find in the present number reports of observations on the *Aspergillus glaucus*, and two other newly-discovered parasitic Fungi, found in the passages of the ear, and connected with certain forms of deafness, and a description of a cure in the case of the former species by the external application of alcohol. The greater part of the number is devoted to a dissertation by Dr. Hallier on the parasites of infectious diseases. A portion of this paper is occupied by a discussion whether the minute *Myxogastres* found on decayed wood, grass, &c., belong to the animal or vegetable kingdom. Since the only high authority who has maintained the animal nature of these parasites, Dr. de Bary, in opposition to Fries, Berkeley, and others, has since apparently altered his views, the question may now be considered as disposed of. If the apparent spontaneous motion of the young germinating spores of *Trichia* and other Fungi be considered proof of an animal nature, the same argument must be applied to the zoospores of certain Algæ. A. W. B.

Serials

Hardwicke's Science Gossip, for December, contains, among others, articles on the employment of wild flowers for decorative purposes (in gardens), on the invasion of lady-birds, on the structure of the hairs of plants, on variations in the *Primulaceæ*, on the influence of food and light on *Lepidoptera*, and on the natural history of the Ruff and Reeve.

The *Monthly Microscopical Journal* for December (No. 12) contains some remarks on the nineteen-band test-plate of Nobert, and on immersion lenses, by Mr. J. J. Woodward, United States Army; a paper on high-power definition, with illustrative examples, illustrated with a plate of test-objects, by Dr. G. W. Royston-Pigott; and one entitled "My Experience in the Use of various Microscopes," by Dr. H. Hagen. These relate to the instrument and its use. The papers devoted to subjects for investigation are—one by Mr. Staniland Wake, on the Development of Organisms in Organic Infusions, and further remarks on the Plumules or Battledore Scales of some of the *Lepidoptera*, by Mr. John Watson, the latter illustrated with a plate. The Microscopical Society's Proceedings contain some interesting remarks on the Scales of the *Thysanura*, in connection with Dr. Pigott's paper.

The recent numbers of the *Revue des Cours Scientifiques*, a periodical which is hardly so well known in this country as it deserves to be, and which is intended to furnish a general weekly statement of the proceedings of the principal scientific societies both in France and in other countries, contain translations of Dr. Christison's historical account of the operations of the Royal Society of Edinburgh from 1783 to 1811; of Sir Roderick Murchison's anniversary address to the Geographical Society in May last; and of the first of Dr. Bence Jones's lectures on Matter and Force, delivered before the Royal College of Physicians. Of foreign scientific doings, we find a translation of Carl Vogt's paper on the Primitive History of Man, read before the meeting of German naturalists at Innsbrück, and M. Vulpian's lecture on Pathological Anatomy, delivered at the Faculty of Medicine in Paris.